

CLAIMS

1) A method of packing a product (2) in a flat tubular package (3) having two first lateral walls (4);
5 and two second lateral walls (5), each connected on one side to one first lateral wall (4), and on the other side to the other first lateral wall (4), by respective preformed fold lines (6); the method comprising the steps of engaging a first lateral wall (4) of the flat tubular
10 package (3) and a second lateral wall (5) of the flat tubular package (3) by means of a first portion (30) and a second portion (31) respectively of a first suction gripping head (14), generating a rotational movement between the first (30) and second (31) portion of the
15 first suction gripping head (14), to rotate the first and second lateral wall (4, 5) engaged by the first suction gripping head (14) with respect to each other, and so convert the flat tubular package (3) from the flat configuration to an open configuration, and inserting the
20 product (2) inside the open tubular package (3); the method being characterized in that the rotational movement between the first (30) and second (31) portion of the first suction gripping head (14) is made about an axis (32) of rotation not coincident with the fold line
25 (6) between the first and second lateral wall (4, 5) engaged by the first suction gripping head (14); suction cups (34) on the second portion (31) moving in a direction perpendicular to the axis (32) of rotation

during the rotational movement between the first (30) and second (31) portion of the first suction gripping head (14).

2) A method as claimed in Claim 1, wherein the flat
5 tubular package (3) is engaged by the first suction gripping head (14) at a pickup station (11), and is transferred, attached to the first suction gripping head (14), to a receiving station (17) where the product (2) is inserted inside the open tubular package (3); the flat
10 tubular package (3) being converted from the flat configuration to the open configuration during transfer from the pickup station (11) to the receiving station (17).

3) A method as claimed in Claim 2, wherein,
15 following insertion of the product (2) inside the open tubular package (3), the first suction gripping head (14) engaging the open tubular package (3) is moved to feed the open tubular package (3) to a sealing station (16) where the open tubular package (3) is sealed.

20 4) A method as claimed in Claim 3, wherein the first suction gripping head (14) transfers the open tubular package (3) to conveying means (40, 46) located at the sealing station (16) and for feeding the open tubular package (3) through the sealing station (16) and to an
25 output station.

5) A method as claimed in Claim 2, wherein, following insertion of the product (2) inside the open tubular package (3), the open tubular package (3) is

sealed at the receiving station (17), and the first suction gripping head (14) engaging the sealed tubular package (3) is moved to feed the sealed tubular package (3) to an output station.

5 6) A method as claimed in one of Claims 3 to 5, wherein the open tubular package (3) is sealed by folding, one on top of another, flaps (7, 8) projecting from the first and second lateral walls (4, 5), and by applying respective lengths (10) of adhesive tape to the
10 folded flaps (7, 8).

 7) A method as claimed in one of Claims 1 to 5, wherein the flat tubular package (3) is picked up by the first suction gripping head (14) off a stack (13) of flat tubular packages (3).

15 8) A method as claimed in Claim 7, wherein, before engaging the top flat tubular package (3) in the stack (13), the first suction gripping head (14) determines the exact position of the flat tubular package (3), and adapts its own position accordingly, so as to engage the
20 flat tubular package (3) in accordance with a given mutual arrangement.

 9) A method as claimed in Claim 8, wherein the first suction gripping head (14) is movable with four degrees of freedom comprising three translatory movements in
25 three perpendicular directions (18, 19, 20), and one rotational movement about an axis (21) perpendicular to the plane of the flat tubular package (3).

 10) A method as claimed in one of Claims 1 to 9, and

comprising engaging a first lateral wall (4) of the flat tubular package (3) and a second lateral wall (5) of the flat tubular package (3) by means of the first portion (30) and second portion (31) respectively of the first suction gripping head (14), and by also engaging, by means of a second suction gripping head (47), the first lateral wall (4) of the flat tubular package (3) opposite the first lateral wall (4) engaged by the first suction gripping head (14); the flat tubular package (3) being converted from the flat configuration to the open configuration by the rotational movement between the first (30) and second (31) portion of the first suction gripping head (14), and also by a relative rotational movement between the first suction gripping head (14) and the second suction gripping head (47).

11) A method as claimed in Claim 10, wherein, once the flat tubular package (3) is converted to the open configuration, the second suction gripping head (47) releases the first lateral wall (4) of the open tubular package (3).

12) A method as claimed in Claim 10 or 11, wherein the second suction gripping head (47) is rotated about a vertical axis (50) between a rest position allowing free vertical movement of the first suction gripping head (14), and a work position wherein the second suction gripping head (47) engages the flat tubular package (3).

13) A method as claimed in Claim 10, 11 or 12, wherein the relative rotational movement between the

first suction gripping head (14) and the second suction gripping head (47) is made by keeping the second suction gripping head (47) stationary, and moving the first suction gripping head (14).

5 14) A method as claimed in one of Claims 1 to 13, wherein product (2) is defined by a group (2) of cartons of cigarettes.

15 15) A machine for packing a product (2) in a flat tubular package (3) having two first lateral walls (4); and two second lateral walls (5), each connected on one side to one first lateral wall (4), and on the other side to the other first lateral wall (4), by respective preformed fold lines (6); the machine (1) comprising a first suction gripping head (14) having a first (30) and a second (31) portion, a first actuating device (15) for causing the first portion (30) and the second portion (31) of the first suction gripping head (14) to engage a first lateral wall (4) of the flat tubular package (3) and a second lateral wall (5) of the flat tubular package (3) respectively, actuating means (33) for generating a rotational movement between the first (30) and second (31) portion of the first suction gripping head (14), to rotate the first and second lateral wall (4, 5) engaged by the first suction gripping head (14) with respect to each other, and so convert the flat tubular package (3) from the flat configuration to an open configuration, and an insertion device (36) for inserting the product (2) inside the open tubular package (3); the machine (1)

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being characterized in that the first (30) and second (31) portion of the first suction gripping head (14) are hinged and rotated by the actuating means (33) about an axis (32) of rotation not coincident with the fold line (6) between the first and second lateral wall (4, 5) engaged by the first suction gripping head (14); the first (30) and second (31) portion of the first suction gripping head (14) comprising respective suction cups (34); and the suction cups (34) of the second portion (31) being fitted to the second portion (31) to move in a direction perpendicular to the axis (32) of rotation during the rotational movement between the first (30) and second (31) portion of the first suction gripping head (14).

15 16) A machine as claimed in Claim 15, and comprising a pickup station (11), where the flat tubular package (3) is engaged by the first suction gripping head (14), and a receiving station (17); the first actuating device (15) moving the first suction gripping head (14), attached to 20 the flat tubular package (3), from the pickup station (11) to the receiving station (17); and the actuating means (33) generating a rotational movement between the first (30) and second (31) portion of the first suction gripping head (14) as the first suction gripping head 25 (14) is moved from the pickup station (11) to the receiving station (17).

17) A machine as claimed in Claim 16, wherein the pickup station (11) houses at least one stack (13) of

flat tubular packages (3), which are engaged successively by the first suction gripping head (14).

18) A machine as claimed in Claim 17, wherein the first suction gripping head (14) comprises a sensor (35) for determining the exact position of the top flat tubular package (3) in the stack (13) before the flat tubular package (3) is engaged; a control unit being provided to control the first actuating device (15) supporting the first suction gripping head (14), so as to adapt the position of the first suction gripping head (14) to the exact position of the flat tubular package (3), and engage the flat tubular package (3) in accordance with a given mutual arrangement.

19) A machine as claimed in Claim 18, wherein the first actuating device (15) moves the first suction gripping head (14) with four degrees of freedom comprising three translatory movements in three perpendicular directions (18, 19, 20), and one rotational movement about an axis (21) perpendicular to the plane of the flat tubular package (3).

20) A machine as claimed in one of Claims 16 to 19, and comprising an output station; and conveying means (40, 46) for receiving the open tubular package (3) containing the product (2) from the first suction gripping head (14), and for feeding the open tubular package (3) containing the product (2) to the output station.

21) A machine as claimed in Claim 20, and comprising

sealing means (45) for sealing the open tubular package (3) containing the product (2).

22) A machine as claimed in Claim 21, wherein the sealing means (45) are connected to the conveying means
5 (40, 46).

23) A machine as claimed in Claim 22, wherein the sealing means (45) are located at the receiving station (17).

24) A machine as claimed in one of Claims 20 to 23,
10 wherein said conveying means (40, 46) comprise a first belt conveyor (40) hinged to rotate about a horizontal axis (44) between a horizontal position, in which the first conveyor (40) feeds the open tubular package (3) containing the product (2) along a horizontal path, and a
15 vertical position, in which the first conveyor (40) feeds the open tubular package (3) along a vertical path.

25) A machine as claimed in Claim 24, wherein said conveying means (40, 46) comprise a second belt conveyor (46) aligned with the first belt conveyor (40) when the
20 first belt conveyor (40) is in said vertical position.

26) A machine as claimed in one of Claims 15 to 25, wherein the insertion device (36) comprises a conveyor (37) for feeding the product (2) into alignment with the open tubular package (3); and a pusher (38) for pushing
25 the product (2) inside the open tubular package (3).

27) A machine as claimed in Claim 26, wherein the insertion device (36) comprises fixed sections (39) for assisting insertion of the product (2) inside the open

tubular package (3).

28) A machine as claimed in one of Claims 15 to 27, and comprising a second suction gripping head (47), and a second actuating device (49) for causing the second
5 suction gripping head (47) to engage the first lateral wall (4) of the flat tubular package (3) opposite the first lateral wall (4) engaged by the first suction gripping head (14); the flat tubular package (3) being
10 converted from the flat configuration to the open configuration by the rotational movement between the first (30) and second (31) portion of the first suction gripping head (14), and also by a relative rotational movement between the first suction gripping head (14) and the second suction gripping head (47).

15 29) A machine as claimed in Claim 28, wherein the second actuating device (49) rotates the second suction gripping head (47) about a vertical axis (50) between a rest position permitting free vertical movement of the first suction gripping head (14), and a work position, in
20 which the second suction gripping head (47) engages the flat tubular package (3).

30) A machine as claimed in Claim 28 or 29, wherein the relative rotational movement between the first suction gripping head (14) and the second suction
25 gripping head (47) is generated solely by the first actuating device (15).

AMENDED SHEETS